Online Onion Root Tips

Determining time spent in different phases of the cell cycle

The life cycle of the cell is typically divided into 5 major phases. The phases are listed below, along with the major events that occur during each phase.

Interphase. The cell is engaged in metabolic activity and performing its duty as part of a tissue. The DNA duplicates during interphase to prepare for mitosis (the next four phases that lead up to and include nuclear division). Chromosomes are not clearly discerned in the nucleus, although a dark spot called the nucleolus may be visible.

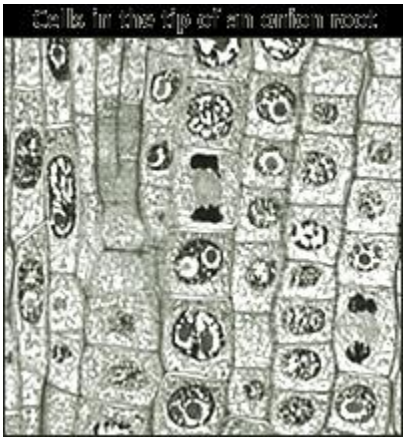
Prophase. Chromatin in the nucleus begins to condense and becomes visible in the light microscope as chromosomes. The nuclear membrane dissolves, marking the beginning of prometaphase. Proteins attach to the centromeres creating the kinetochores. Microtubules attach at the kinetochores and the chromosomes begin moving.

Metaphase. Spindle fibers align the chromosomes along the middle of the cell nucleus. This line is referred to as the metaphase plate. This organization helps to ensure that in the next phase, when the chromosomes are separated, each new nucleus will receive one copy of each chromosome.

Anaphase. The paired chromosomes separate at the kinetochores and move to opposite sides of the cell. Motion results from a combination of kinetochore movement along the spindle microtubules and through the physical interaction of polar microtubules.

Telophase. New membranes form around the daughter nuclei while the chromosomes disperse and are no longer visible under the light microscope. Cytokinesis or the partitioning of the cell may also begin during this stage.

The image to the right is a slide of an onion root in various stages of mitosis. Can you identify each stage?



The assignment: In this activity, you will be presented with cells from the tip of an onion root. You will classify each cell based on what phase it is in. At the end you will count up the cells found in each phase and use those numbers to predict how much time a dividing cell spends in each phase. You can base your calculation on a total cell cycle of 24 hours.

Data Collection

Once you have classified all of the cells, use the screen picture to count the cells in each phase and calculate the percentage in each phase (% = number in phase ÷ total X 100).

	Interphase	Prophase	Metaphase	Anaphase	Telophase	Total
Number of cells						
Percent (%) of cells						100%

Analysis : Using the percent you calculated for each phase and assuming that the cell cycle lasts 24 hours, calculate the number of hours for each phase. Then create a pie chart showing the amount of time cells spend in each phase. (Show Work)

Analysis Questions:

Type your responses to the following questions. To receive full credit you must use complete sentences, MLA format, and proper grammar (NO PRONOUNS).

1. Based on the data **you** collected, what can you infer about the relative length of time an onion root-tip cell spends in each stage of cell cycle?
2. In which stage of cell cycle do the cells spend the most time? Approximately how much time?
3. In which stage of cell cycle do the cells spend the least time? Approximately how much time?
4. Why do you think there were no cells found in cytokinesis? What can you infer about the length of time cells spend in cytokinesis?

Conclusion

Your conclusion should be in paragraph form and should start with a sentence that begins with the words "According to the evidence …" or "The evidence suggests …". This conclusion should tell me what you have discovered about the relative percentage of cells in each phase and the number of hours for each phase assuming a 24 hour life cycle. The conclusion should also discuss what assumptions are being made, that might mean that the percentages calculated may not actually represent the real overall percentages.